

## COLLAPSIBLE WHEELBARROW

### Field of Invention

This invention relates to wheelbarrows. In particular, this invention relates to a collapsible wheelbarrow for domestic and industrial use.

### Background of the Invention

Wheelbarrows are popularly used for a variety of domestic and industrial purposes, such as for storing and transporting materials like soil and other gardening media, foliage, gardening supplies and construction materials, mixing and transporting cement and concrete, etc. A wheelbarrow is essentially a container mounted on a wheel supporting the front of the container, with rear legs that allow the wheelbarrow to stand self-supported and handles for raising the legs off of the ground so that the wheelbarrow rolls freely on the wheel.

To accommodate the myriad uses for which they are suited and maximize productivity during use, wheelbarrows tend to be bulky and somewhat cumbersome. The container portion must have the capacity to store and transport a reasonably large load, and in general the side walls of the container are flared for easier access to the container bottom and to facilitate dumping of materials. The legs are splayed to a wide stance, to stabilize the wheelbarrow when free standing. These features result in a large frame and container which is commensurately difficult to store, package and ship, and transport from one site to another.

It would accordingly be advantageous to provide a wheelbarrow which is collapsible, so that when not in use it can be collapsed to occupy less space and thus be more readily stored, packaged and transported. However, the container should be water-tight, to allow for popular uses such as mixing mortar, concrete, cement and the like, which renders the use of a collapsible container formed from rigid panels problematic. Further, the wheelbarrow must not lose its structural integrity or collapse inadvertently when carrying heavy loads such as construction materials.

The present invention overcomes these disadvantages by providing a collapsible wheelbarrow having a flexible container mounted on a foldable frame. The frame folds vertically, laterally and longitudinally, to provide a collapsed wheelbarrow which is considerably smaller in all three dimensions than the wheelbarrow in its unfolded condition.

The invention accomplishes this by providing a container formed from a water-tight, rugged and flexible fabric, to retain the versatility of a conventional wheelbarrow while substantially reducing the size of the container in the collapsed condition. The container is mounted on a frame which is hinged to allow the wheelbarrow to collapse in two directions, and comprises handles which are articulated to the frame and can be folded alongside the frame to collapse the wheelbarrow longitudinally.

The present invention thus provides collapsible wheelbarrow, comprising a frame comprising a pair of opposed leg support members connected to a pair of opposed wheel support members at a pair of opposed hinges, such that the frame folds in a vertical direction, each leg support member comprising a leg disposed rearwardly of the hinge and a front support element disposed forwardly of the hinge, each wheel support member comprising a rear support element disposed rearwardly of the hinge and a wheel support element disposed forwardly of the hinge, wherein front ends of the leg support members are hingedly connected and front ends of the wheel support members are hingedly connected such that the frame folds in a lateral direction, and a container formed from a flexible material having front, rear and side edges, the front edge being mounted to the front support elements and the rear edge being mounted to the rear support elements, and first locking means for retaining the frame in a vertically unfolded condition and second locking means for retaining the frame in a laterally unfolded condition.

In a further aspect of the invention the first locking means comprises a pair of opposed handles, the handles being hingedly attached to the rear support elements and comprising rear support arms pivotable from a folded position to an unfolded position in which the rear support arms tension the side edges of the container against the front support elements.

The present invention further provides a kit of parts for assembling a collapsible wheelbarrow, comprising a pair of opposed leg support members, a pair of

opposed wheel support members for connection to the opposed leg support members to form a frame, the wheel support members being connectable to the opposed leg support members at a pair of opposed hinges such that the frame folds in a vertical direction, each leg support member comprising a leg disposed rearwardly of the hinge and a front support element disposed forwardly of the hinge, each wheel support member comprising a rear support element disposed rearwardly of the hinge and a wheel support element disposed forwardly of the hinge, front ends of the leg support members being hingedly connectable and front ends of the wheel support members being hingedly connectable such that the frame folds in a lateral direction, and a container formed from a flexible material having front, rear and side edges, the front edge being mountable to the front support elements and the rear edge being mountable to the rear support elements, and first locking means for retaining the frame in a vertically unfolded condition and second locking means for retaining the frame in a laterally unfolded condition.

#### Brief Description of the Drawings

In drawings which illustrate by way of example only a preferred embodiment of the invention,

Figure 1 is a side elevation of the wheelbarrow in an unfolded condition,

Figure 2 is a front end elevation of the wheelbarrow in the unfolded condition,

Figure 3 is a side elevation of the wheelbarrow in a collapsed condition,

Figure 4 is a bottom plan view of the wheelbarrow in the collapsed condition,

Figure 5 is an exploded perspective view of the wheelbarrow,

Figure 6 is a plan view of a pattern for the container of the wheelbarrow,

Figure 7 is a partial side elevation showing a handle for the wheelbarrow in the unfolded condition,

Figure 8 is a partial side elevation showing the handle for the container of the wheelbarrow of Figure 1 in the collapsed condition,

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Figure 9 is a bottom plan view of the retainer latch,

Figure 10 is a bottom plan view of the scissor lock, and

Figure 11 is a perspective view of a lock washer limiting the unfolding motion of the frame.

#### Detailed Description of the Invention

Figures 1 to 5 illustrate a preferred embodiment of the invention. The wheelbarrow 10 comprises a container 20 mounted on a frame 30.

The container 20 is preferably formed from a flexible, water-tight fabric which is sufficiently sturdy to be self-supporting in the unfolded condition and to resist tearing during ordinary use, for example a commercially available rugged plastic or rubber membrane or a plastic- or rubber-impregnated fabric or mesh.

The container 20 comprises a bottom panel 22, rear panel 24 and side panels 26, illustrated in Figure 6, which may be sewn, bonded or welded together in conventional fashion. The edges of the panels 22, 24, 26 are provided with reinforcing flaps 22a, 24a, 26a, respectively, which are folded over onto the panel and sewn, bonded or welded to the panel to form hems which rigidify the upper edges and increase resistance to tearing and separation of panels. It will be appreciated that the particular fabric used for the container and the precise configuration, mode of attachment and dimensions of the panels 22, 24, 26 are a matter of selection.

The container 20 is mounted on a frame 30 comprising left and right leg support members 40 respectively hinged to left and right wheel support members 50 at an intermediate point thereof. The support members 40, 50 are preferably formed from corrosion-resistant metal tubing suitable for the intended load capacity of the wheelbarrow.

The leg support members 40 each comprise a leg 42 preferably integrally formed with a front support element 44 which supports the front end of the container 20 through a fabric or metal strap 38 extending between the front support elements 42 at an intermediate position. The top-front edge of the container 20 is affixed by bolts, screws,

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rivets or other suitable fastening members through retaining bars 48a to crossbar elements 48 extending laterally inward from the front support elements 44, which are hinged together at 49. The legs 42 preferably have hooked feet 46, which provide handles to facilitate grasping the frame for unfolding and carrying the wheelbarrow 10.

Each wheel support member 50 comprises wheel mount element 52 preferably integrally formed with a rear support element 54 which supports the rear end of the container 20 as hereinafter described. The main hinges 33 connect the respective left and right support members 40, 50 in a scissors fashion, so that when folded the wheel support members 50 nest within the leg support members 40, as shown in Figure 4. This provides the frame 30 with the ability to fold vertically.

The wheel mount elements 52 comprise crossbar elements 58, shown in Figure 2, which are hinged together at 59. The hinge 59 operates in conjunction with the hinge 49 to provide the frame with the ability to fold laterally. As shown in Figure 5, the hinges 49, 59 may be formed from a constricted end of one crossbar element 48 or 58, projecting into the other crossbar element 48 or 58, respectively, and secured therein by a pin or bolt so as to be pivotable within an arc sufficient to allow the leg support members 40 and the wheel support members 50 to be folded toward one another as shown in Figure 4.

The wheel 12 is mounted on an axle 14 extending through brackets 56 which depend from the wheel support members 50. Typically a suitable position would be recessed from the crossbar elements 58, which allows the wheelbarrow 10 to be tipped forward supported by the crossbar elements 58 (ie. off of the wheel 12) to facilitate dumping a load from the front of the wheelbarrow 10. The axle is slidably received in brackets 56, which allows the brackets 56 to slide along the axle 14 as the frame is folded and unfolded in the lateral direction.

The rear support elements 54 of the wheel support members 50 are articulatively connected to handles 60 at hinge arms 62. The ends of the hinge arms 62 are hingedly connected to the handles 60 and to the rear support elements 54 so that the hinged ends 64 of the handles 60 butt against the hinged ends 56 of the rear support elements 54 when the handles 60 are opened to the unfolded position shown in Figures 1 and 7.

Preferably the hinged ends 64 of the handles 60 are beveled and the hinged ends 56 of the rear support elements 54 are beveled complimentary to the hinged ends 64 of the handles 60, as shown in Figures 7 and 8, so that the application of downward pressure to the handles in the unfolded position firmly engages and aligns the hinged ends 64 of the handles 60 with the hinged ends 56 of the rear support elements 54. As the handle 60 is unfolded a bolt 66 affixed to the hinge arm 62 by bracket 65 swings into position over the joint between the hinged ends 64 of the handles 60 and the hinged ends 56 of the rear support elements 54. Rotation of the knob 68 drives the bolt 66 through the hinged end of the handle 60 and into a nut 67 welded to the interior of the hinged end of the rear support element 54 (shown in phantom in Figures 7 and 8) to lock the hinge arm 62 in the unfolded position shown in Figure 7 when the wheelbarrow 10 is in use. This also locks the frame 30 in the vertically unfolded condition, as is described below.

Rear support arms 72 are respectively connected to the bolts or pins which secure the ends of the hinge arms 62. The free ends 74 of the rear support arms 72 project upwardly in the unfolded position to support the top-rear corners of the container 20, to which the free ends 74 of the rear support arms 72 are affixed by bolts, rivets or any other suitable fastening member.

The frame 30 is retained in the unfolded condition shown in Figures 1 and 2 by a scissor lock assembly 80, shown in Figures 4 and 10, which comprises a pair of bars 82 connected at an intermediate point by hinge 84 and each bar 82 having one end pivotally connected to one wheel support member 50 near the rear end of the frame 30. Each bar 82 has a slot 86 positioned to engage over a pin 88 projecting from the other bar 82, best seen in Figure 10. When the frame 30 is in the collapsed condition (scissor hinge in position "A" shown in phantom lines in Figure 10) the bars 82 are oriented at an acute angle relative to one another. As the frame 30 is unfolded the bars assume an obtuse angle relative to one another (scissor hinge in position "B" shown in phantom lines in Figure 10), and to lock the frame 30 into the unfolded condition (shown in solid lines in Figure 10) the bars 82 are forced into alignment with the pins 88 engaged into the slots 86. This stabilizes the spacing between the wheel support members 50, and thus between the leg support members 40 which are hinged thereto, to retain the frame 30 in the unfolded position. The scissor lock assembly 80 also

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provides considerable leverage as the frame 30 approaches the unfolded condition, which tensions the top edges of the container 20 for enhanced rigidity and greater stability.

The frame 30 is retained in the collapsed condition by a retainer bar 90, shown in Figures 4 and 9, which may be pivotally connected to one wheel support member 50 at the point of attachment of one side of the scissor lock assembly 80. As shown in Figure 9, the retaining bar 90 is provided near its free end with a slot 92 which engages over a pin 94 projecting from the hinge of the opposite bar 82 in the scissor lock assembly 80, to prevent the frame 30 from unfolding inadvertently from the collapsed condition.

In operation, with the frame 30 in the collapsed condition shown in Figures 3 and 4, the retaining bar 90 is manually pivoted away from the pin to release the frame 30 for unfolding. Grasping the feet 46, the user pulls the leg support members 40 apart to unfold the frame 30 laterally, grasping and pulling the scissor lock assembly 80 into the unfolded position (bars 82 aligned) shown in solid lines in Figure 10, locking the frame 30 into the laterally unfolded condition. This causes the rear support arms 72 to tension the top-rear edge of the container 20 and unfolds the hinges 49 and 59. The top-front edge of the container 20 is retained in a tensioned condition by the retainer bars 48a affixed to crossbars 48.

The user unfolds the handles 60, swings the latch bar 66 into the locked position shown in Figure 7 and tightens each knob 68 to drive the bolts 66 through the ends of the handles 60 into the nuts 67, to lock the handles 60 in the unfolded position. Unfolding the handles 60 causes the rear support arms 72 to swing upright, drawing the top-rear corners of the container 20 rearwardly and, by tensioning the top-side edges of the container 20, drawing the front support elements 44 away from the wheel support elements 52. The frame 30 thus unfolds vertically in a scissors fashion, and is retained in the vertically unfolded condition so long as the handles 60 remain locked in the unfolded condition, by the tension of the top-side edges of the container 20 between the rear support arms 72 and the crossbars 48. The reinforcing hems along the top edges of the container 20 thus serve as tensioning elements to retain the frame 30 in the vertically unfolded condition.

The frame 30 is prevented from overextending into the vertically unfolded condition by lock washers 96, shown in Figure 11, disposed between the leg support members 40 and the wheel support members 50. As the frame 30 reaches the vertically

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unfolded condition the stops 96a on the lock washers 96 come into contact with one another and arrest further unfolding of the frame 30. This maintains tension on the top-side edges of the container 20.

The wheelbarrow 10 is now ready for use. The top-side and top-rear edges of the container 20 are maintained tensioned by the frame 30, imparting sufficient rigidity to the container 20 to retain the desired shape.

To collapse the wheelbarrow 10 of the invention, the thumbscrews 68 are loosened and, the latch bars 66 are pivoted out of the locked position and the handles 60 are folded over the frame 30, which retracts the rear support arms 72 and allows the front support element 44 to collapse toward the wheel mount element 52 in a scissors fashion. The user pushes the hinge 84 of the scissor lock assembly 80 forwardly, causing the slots 86 to disengage from the pins 88 and the bars 82 to fold toward one another, which collapses the frame 30 laterally. The retainer bar 90 is pivoted to latch onto the pin 88, and the collapsed wheelbarrow 10 is ready for storage or transport.

A preferred embodiment of the invention having been thus described by way of example only, it will be apparent to those skilled in the art that certain modifications and adaptations may be made without departing from the scope of the invention, as set out in the appended claims.



THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

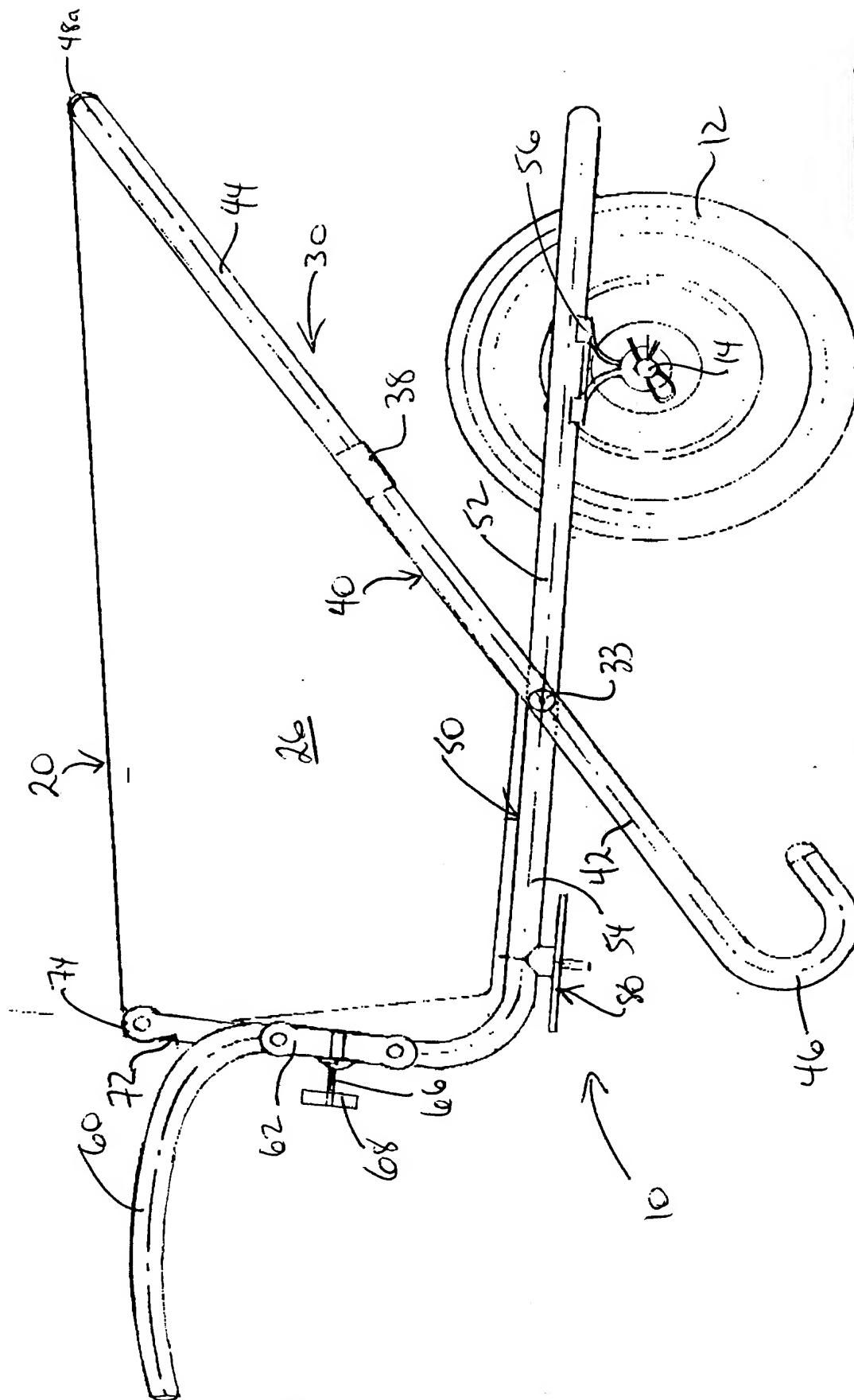
1. A collapsible wheelbarrow, comprising
  - a frame comprising a pair of opposed leg support members connected to a pair of opposed wheel support members at a pair of opposed hinges, such that the frame folds in a vertical direction,
    - each leg support member comprising
      - a leg disposed rearwardly of the hinge and a front support element disposed forwardly of the hinge,
    - each wheel support member comprising
      - a rear support element disposed rearwardly of the hinge and a wheel support element disposed forwardly of the hinge,
  - wherein front ends of the leg support members are hingedly connected and front ends of the wheel support members are hingedly connected such that the frame folds in a lateral direction, and
  - a container formed from a flexible material having front, rear and side edges, the front edge being mounted to the front support elements and the rear edge being mounted to the rear support elements, and
  - first locking means for retaining the frame in a vertically unfolded condition and second locking means for retaining the frame in a laterally unfolded condition.
2. The collapsible wheelbarrow of claim 1 in which the first locking means comprises a pair of opposed handles, the handles being hingedly attached to the rear support elements and comprising rear support arms pivotable from a folded position to an unfolded position in which the rear support arms tension the side edges of the container against the front support elements.

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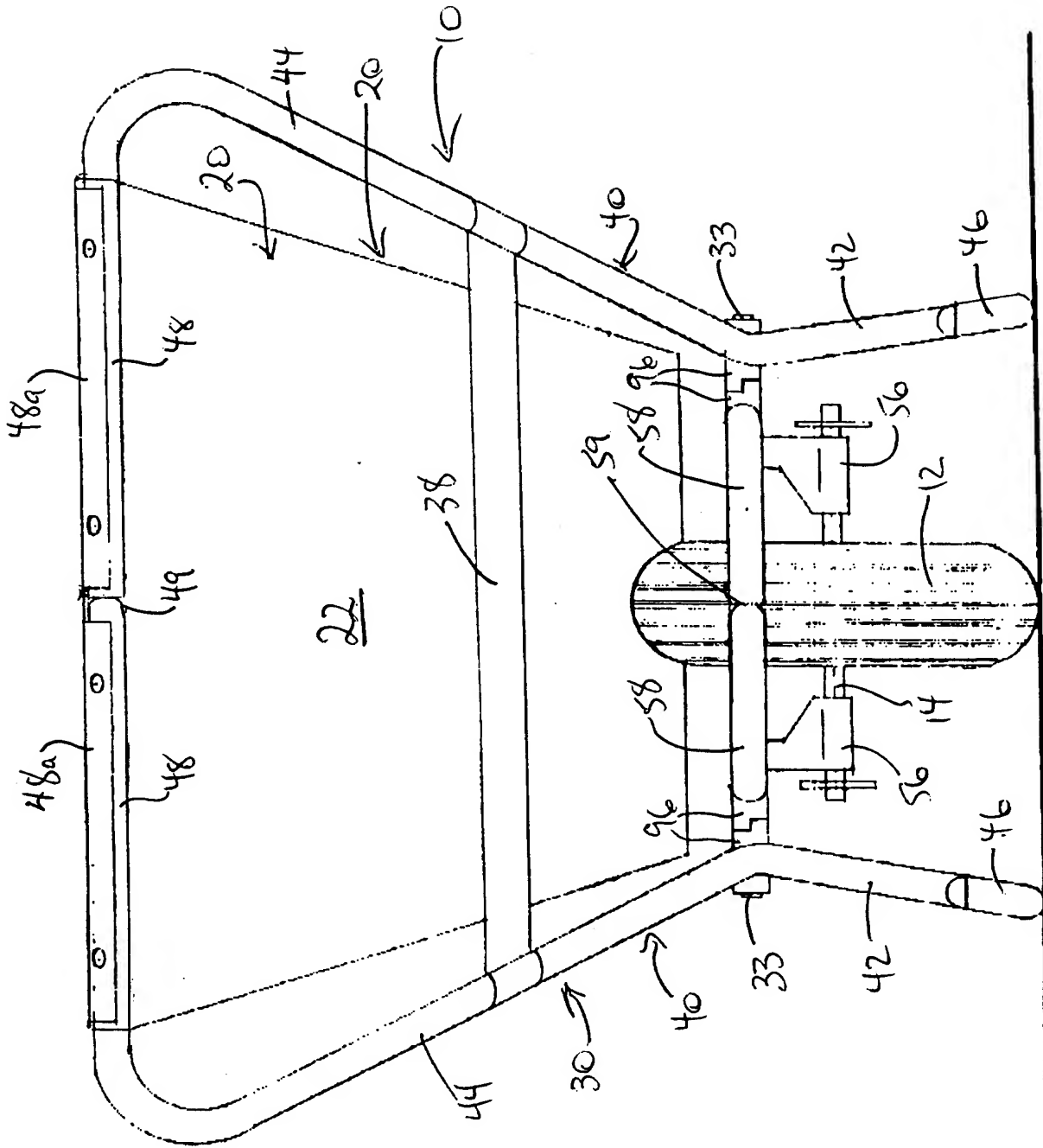
3. A kit of parts for assembling a collapsible wheelbarrow, comprising
- a pair of opposed leg support members,
  - a pair of opposed wheel support members for connection to the opposed leg support members to form a frame, the wheel support members being connectable to the opposed leg support members at a pair of opposed hinges such that the frame folds in a vertical direction,
  - each leg support member comprising
    - a leg disposed rearwardly of the hinge and a front support element disposed forwardly of the hinge,
  - each wheel support member comprising
    - a rear support element disposed rearwardly of the hinge and a wheel support element disposed forwardly of the hinge,
  - front ends of the leg support members being hingedly connectable and front ends of the wheel support members being hingedly connectable such that the frame folds in a lateral direction, and
  - a container formed from a flexible material having front, rear and side edges, the front edge being mountable to the front support elements and the rear edge being mountable to the rear support elements, and
  - first locking means for retaining the frame in a vertically unfolded condition and second locking means for retaining the frame in a laterally unfolded condition.

Abstract

A collapsible wheelbarrow comprises a container formed from a water-tight, rugged and flexible fabric, mounted on a frame which is hinged in two directions, to allow for both vertical and lateral folding, and having handles which are articulated to the frame and can be folded alongside the frame to collapse the wheelbarrow longitudinally. The frame thus folds vertically, laterally and longitudinally, to provide a collapsed wheelbarrow which is considerably smaller in all three dimensions than the wheelbarrow in its unfolded condition.



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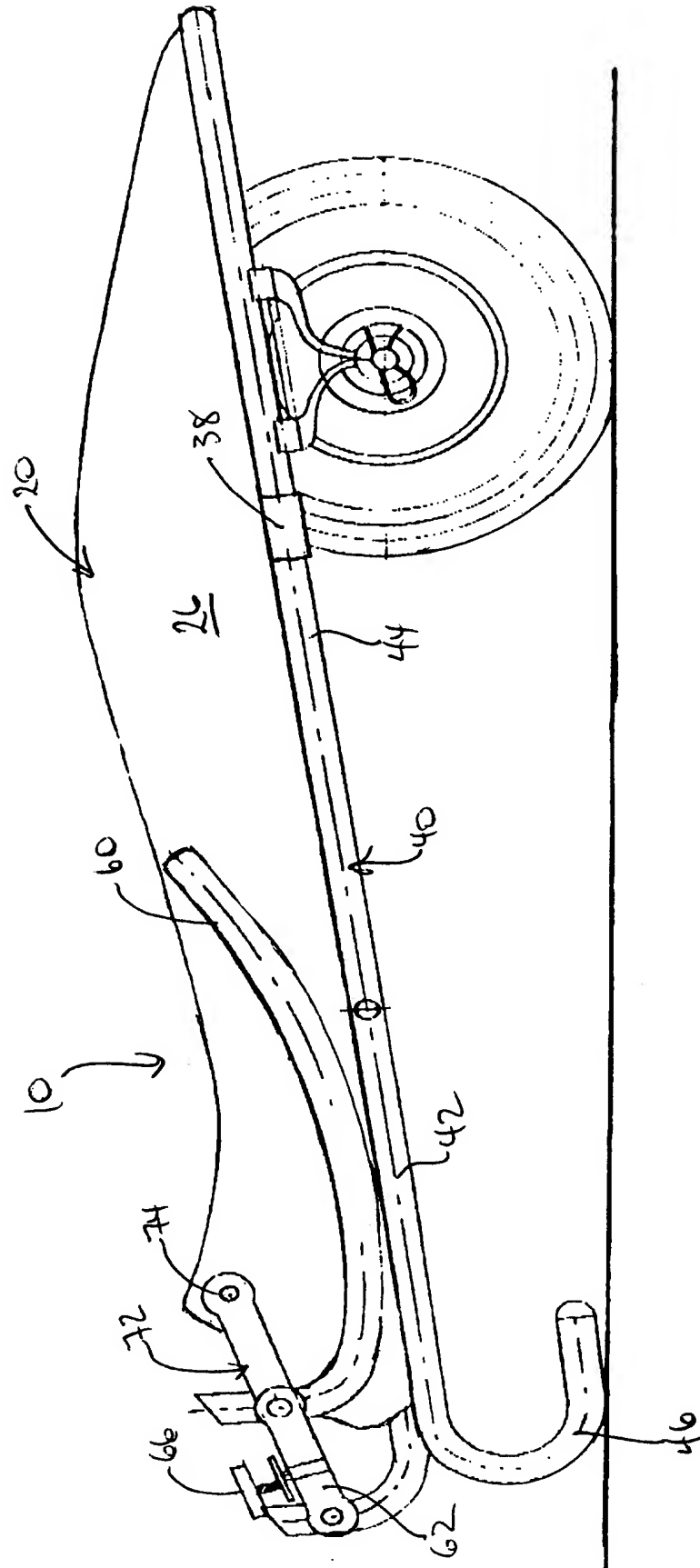


Fig. 3

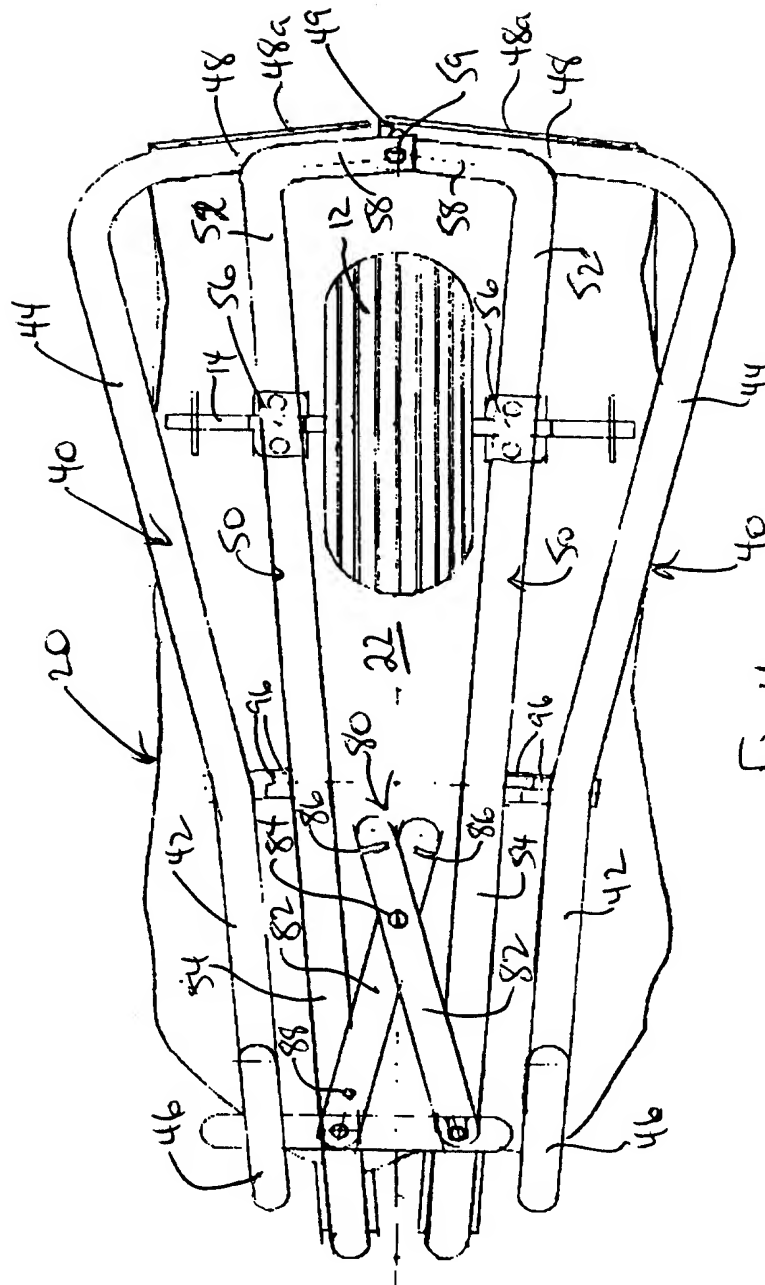


Fig. 4

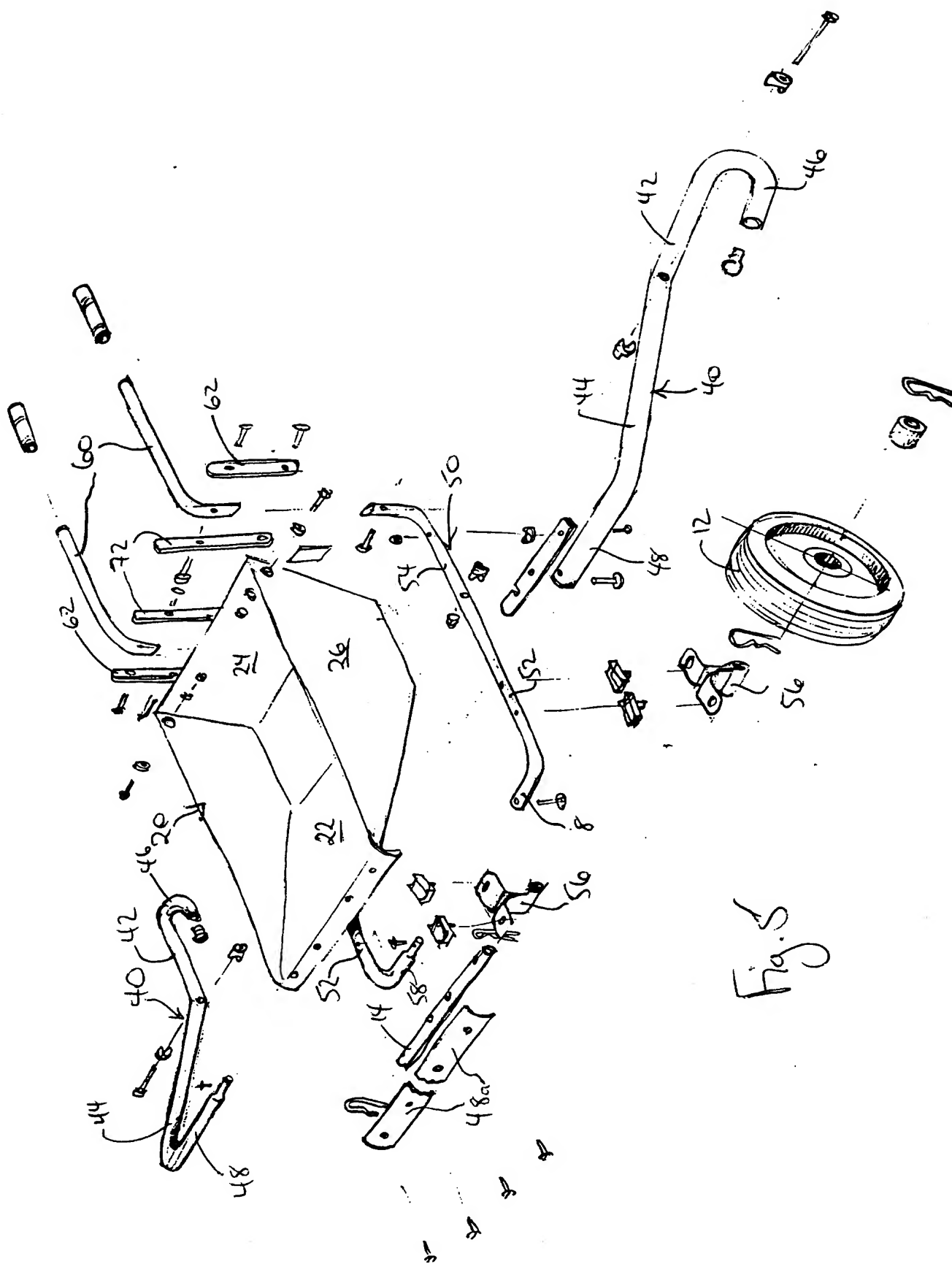
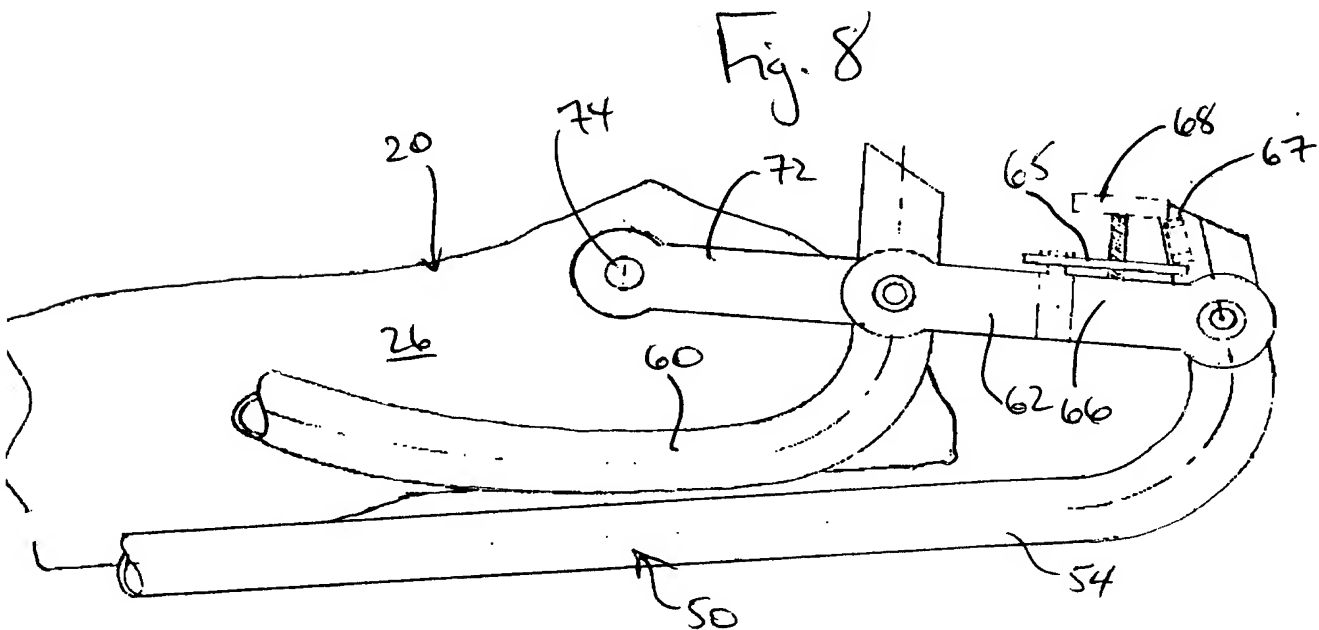
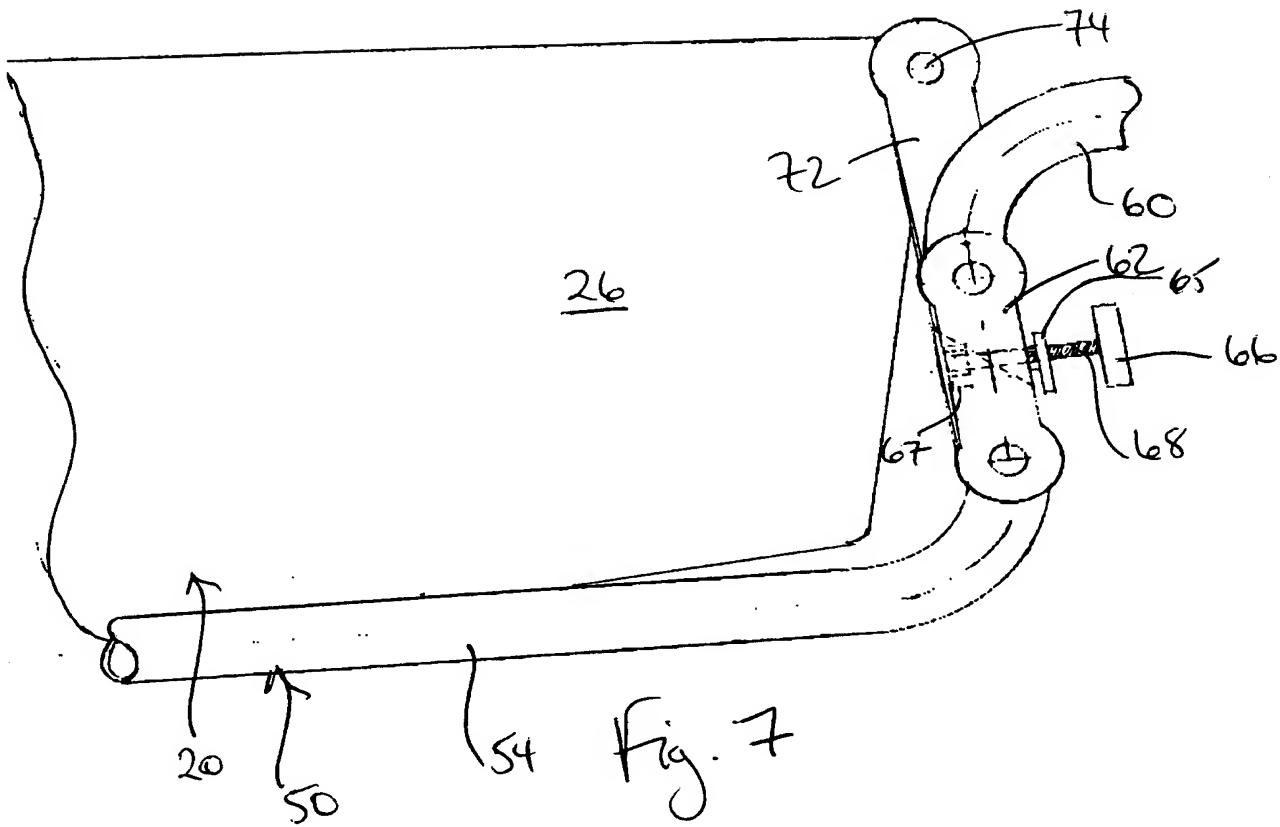


Fig. 5







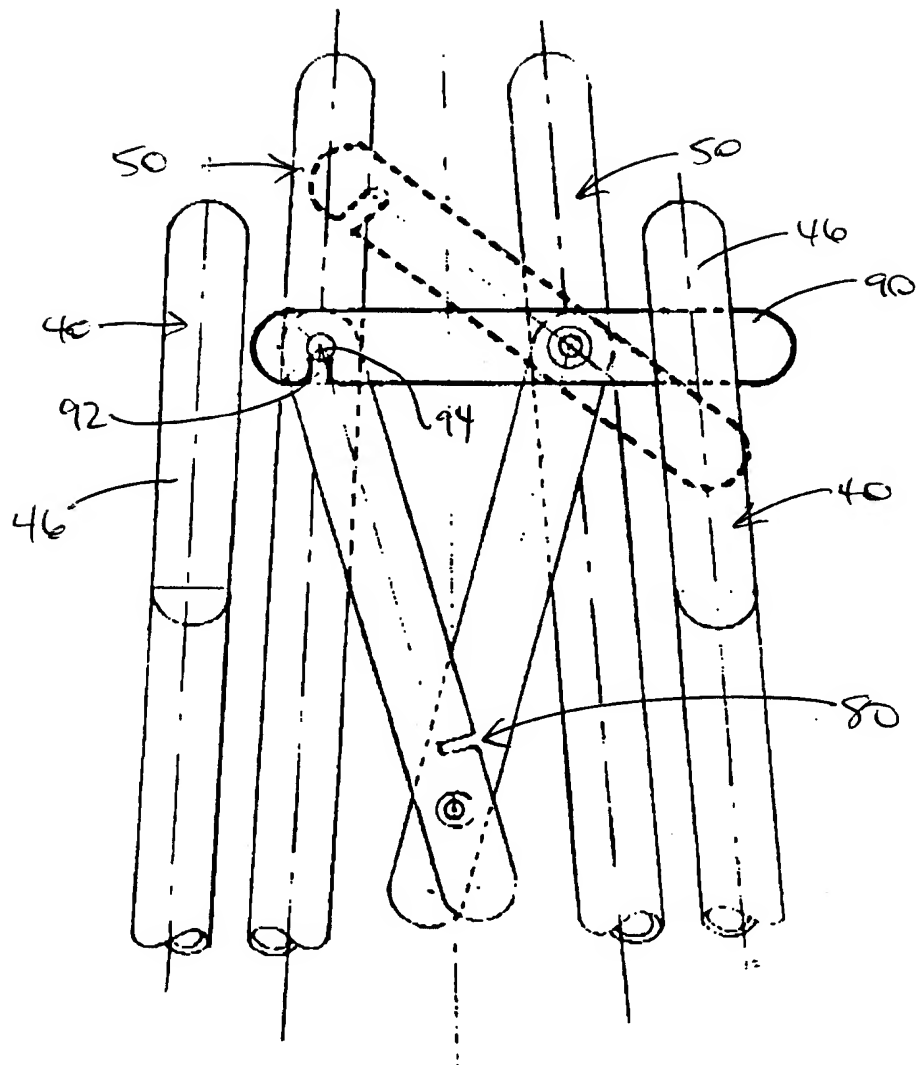
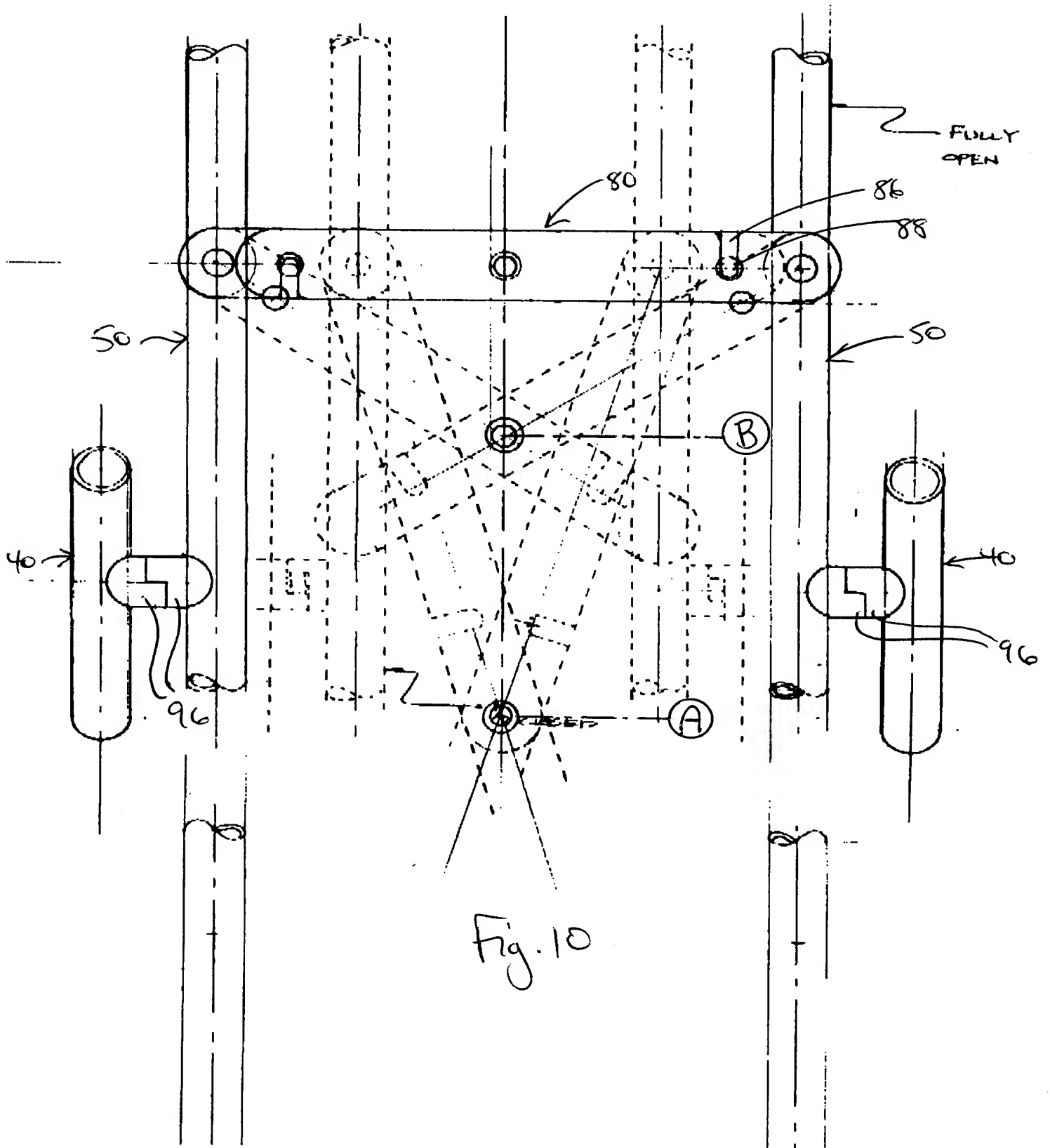


Fig. 9



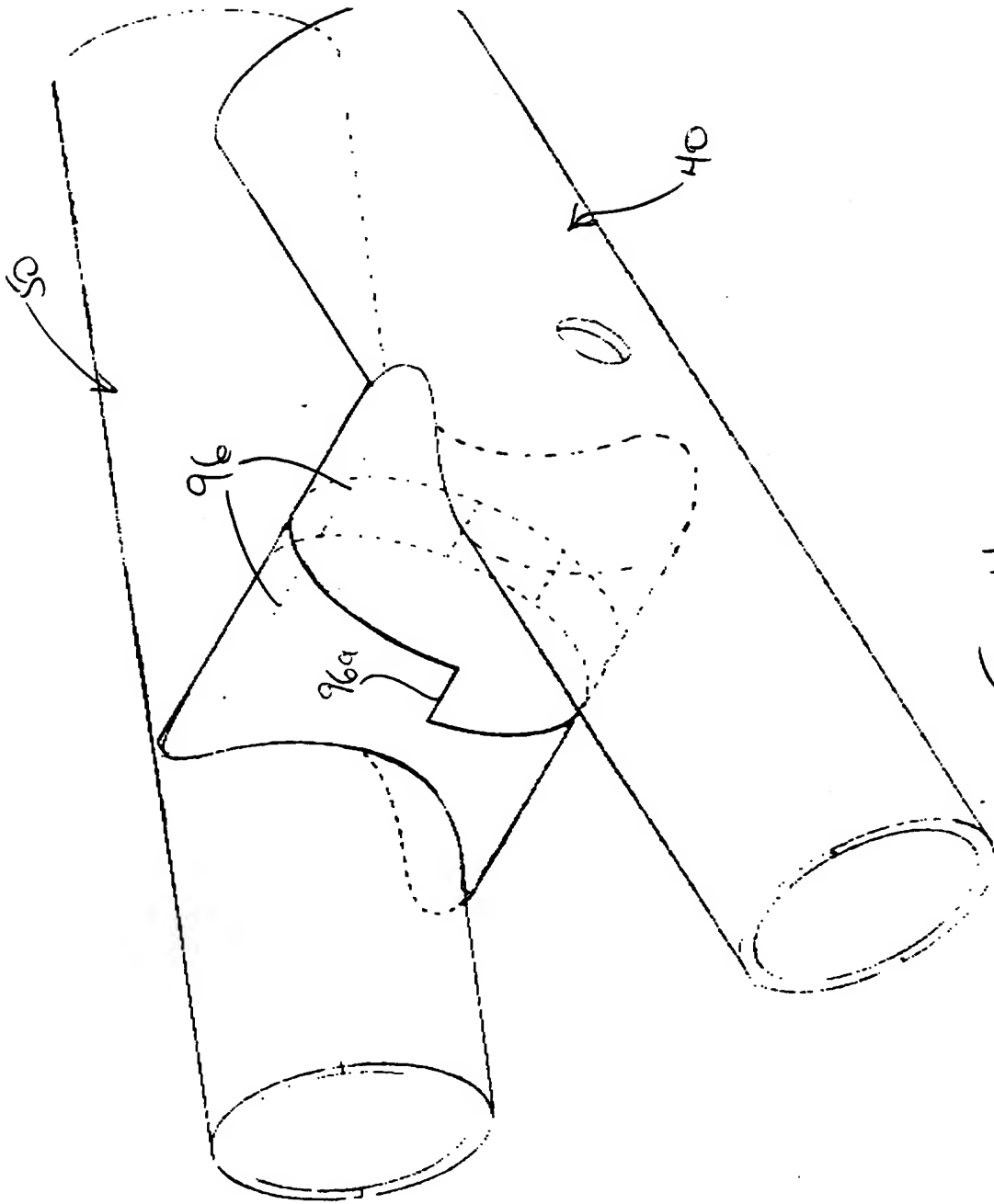


Fig. 11